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ANNOTATED LIST OF SPECIES

An annotated checklist of aquatic avifauna in the human-dominated middle stretch of the Ganga River

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Abstract. The Ganga River is a vital riverine habitat for several endangered species of flora and fauna, including waterbirds. The river flows through densely populated cities such as Kanpur, Prayagraj, and Varanasi. Major threats to the ecological integrity and hydrology of the river include flow alteration, water abstraction at barrages and dams, riverbed agriculture, unsustainable resource extraction such as fishing and sand mining, and discharge of untreated industrial and domestic effluents. Between 2018 and 2021, we conducted avifaunal surveys of the 750 km stretch of the Middle Ganga River and documented 107 aquatic avifaunal species belonging to 11 orders and 25 families. Among the observed species, three are Vulnerable and 11 are Near Threatened. Our study documents the rich diversity of aquatic avifauna despite human-induced habitat degradation and unsustainable resource extraction. We highlight the need for more focused conservation efforts supported by firm policy and legislation.

Key words. Conservation, Ramsar Site, richness, threatened, waterbirds, wildlife sanctuary

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INTRODUCTION

India harbours a rich biodiversity owing to its diverse ecosystems, which include alpine forests, deciduous forests, tropical rainforests, grasslands, deserts, mangroves, freshwaters, and coral reefs (Mittermeier et al. 2011; Rodgers and Panwar 1988). The Indian landmass is categorised into 10 biogeographic zones based on altitude, moisture, topography, and rainfall, and the Gangetic Plains is one of these biogeographic zones. It encompasses the vast floodplain formed by the Ganges River and its tributaries, supports rich aquatic biodiversity, and serves as crucial habitat for numerous species (Rodgers et al. 2000; Kumar et al. 2005). The Gangetic Plains is home to unique and magnificent species such as *Platanista gangetica* (Roxburgh 1801), *Gavialis gangeticus* (Gmelin 1789), *Crocodylus palustris* (Lesson 1831), *Lutrogale perspicillata* (Geoffroy 1826), along with several species of freshwater turtles, fishes, and birds (Rodgers and Panwar 1988; Dudgeon 2000; Das et al. 2022). The Gangetic Plains serve as critical habitats and provide abundant food resources and nesting sites for more than 200 species of waterbird, including ground-nesting birds such as *Grus antigone* (Linnaeus, 1758) and *Rynchops albicollis* (Swainson, 1838) (Kumar 2022). The Gangetic Plains lie within the Central Asian Flyway, a vital and globally significant migratory route for several bird species (Mundkur 2005).

Waterbirds serve as indicators in riverine ecosystems (Rajpar et al. 2022). Their presence, abundance, and diversity reflect the availability of food resources, water quality, and integrity of the habitat. Waterbirds occupy various trophic levels and utilise a wide range of habitats within the ecosystem. They are sensitive to changes in environmental conditions, making them reliable indicators of ecosystem stability and health (Rajpar et al. 2022). As a result, assessing and monitoring the status of waterbirds in riverine ecosystems is essential (Colloff et al. 2018). Moreover, changes in waterbird populations can indicate broader ecological shifts, such as changes in hydrological regimes, pollution, or climate, underscoring their importance as indicators of ecosystem dynamics.

Attempts have been made in the past to document the status of waterbirds in the Ganga River (Rao 2001; Bashir et al. 2012; Khan et al. 2013; Dey et al. 2014; Arya et al. 2020; Joshi et al. 2021). However, systematic surveys have not been conducted across the middle segment of the river, and most of the

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studies were limited to the smaller segments of the river. Previous studies were mostly conducted in the State Wildlife Barasingha Sanctuary (formerly known as Hastinapur Wildlife Sanctuary), Haiderpur Wetland Ramsar Site, and Upper Ganga River Ramsar Site (Rao 2001; Bashir et al. 2012; Khan et al. 2013; Dey et al. 2014; Arya et al. 2020; Joshi et al. 2021), and so there is lack of a comprehensive assessment of the status of the waterbirds in the middle stretch of the Ganga River.

Systematic monitoring is useful in the assessment of the status of threatened species at the regional level and can help in the formulation of conservation strategies (Hussain 1987; Dudgeon 2000). The main objective of our study is to produce a detailed checklist of waterbirds of the middle stretch of the Ganga River.

STUDY AREA

The Ganga River, originating from the Gangotri Glacier of the Himalayas and flowing to the Ganga Sagar in the Bay of Bengal, spans over 2,200 km and passes through the states of Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, and West Bengal (Singh et al. 2007). The river is divided into three major stretches: Upper (from the origin to Haridwar), Middle (Haridwar to Varanasi), and Lower (Varanasi to Ganga Sagar) (WII-GACMC 2018). We conducted our study along the 750 km stretch of the Middle Ganga from Balawali, Bijnor (29.8125°N, 078.1762°E) to Sangam, Prayagraj (25.4303°N, 081.8888°E) in Uttar Pradesh, India (Figure 1). This stretch passes through the densely populated cities of Bijnor, Farrukhabad, Kannauj, Kanpur, and Prayagraj. The majority of the stretch studied is outside of protected areas. Only about 15% (110 km) is protected as the State Wildlife Barasingha Sanctuary, of which a 10 km stretch (1.3%) constitutes the Haiderpur

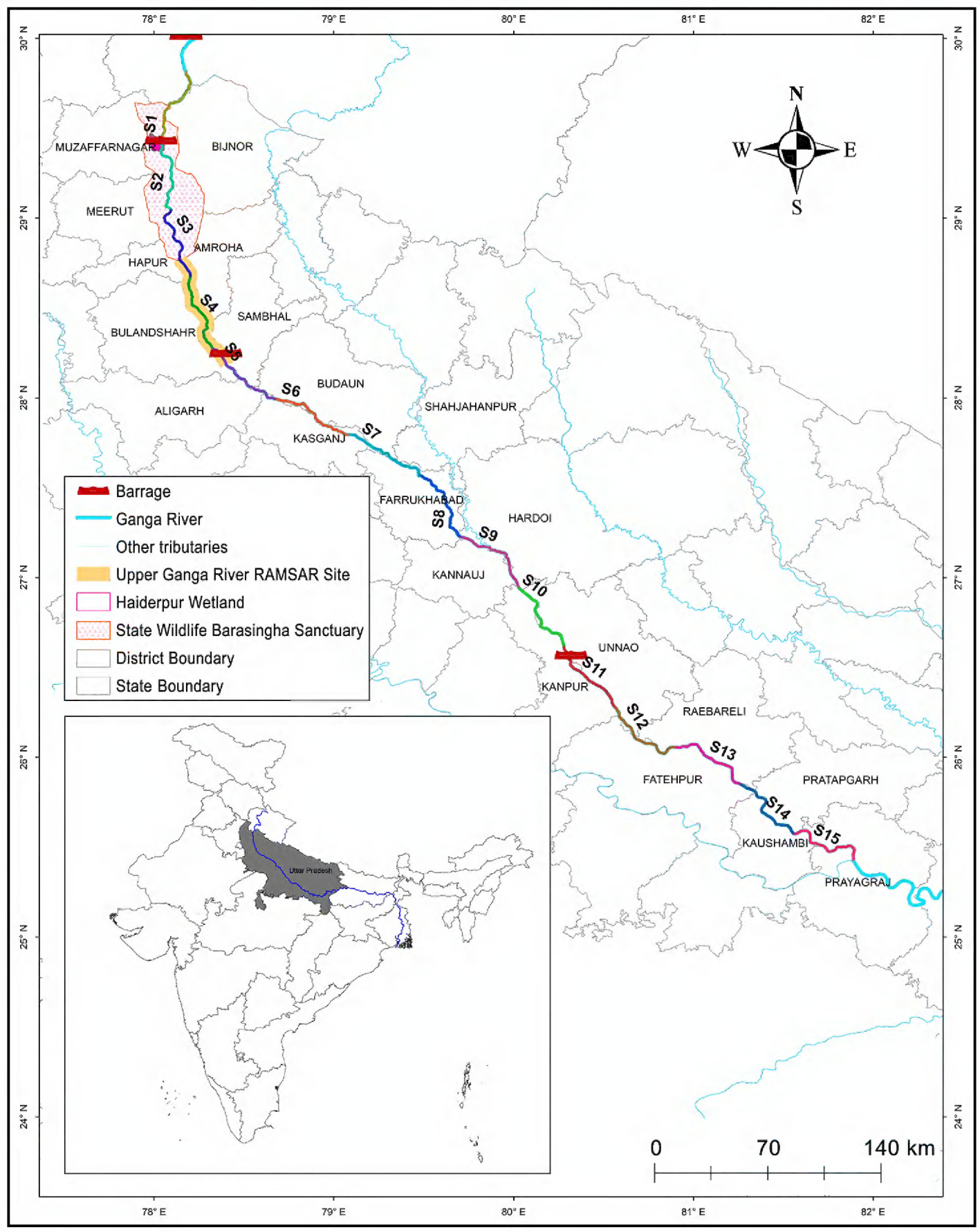

Figure 1. Map of the Middle stretch of the Ganga River in Uttar Pradesh, India.

Wetland Ramsar Site. Additionally, 11% (82 km) is in the Upper Ganga River Ramsar Site, and 3.3% (25 km) is in the Narora Important Birds Area (IBA site code IN-UP-10) (Rahmani et al. 2016). The main geomorphological features of the mainstem Ganga River include channels ranging from narrow to wide with intermittent meanders, alluvial islands, and broad sandbars (Singh et al. 2007). These diverse habitats provide food sources and nesting sites, attracting various resident and migratory bird species throughout the year (Rao 2001).

The middle stretch of the Ganga River supports one of the most densely populated areas in the world, with a population density of 634–1,452 individuals/km^2, significantly higher than the average population density of India (382 individuals/km^2) (GUP 2021). The region faces unsustainable water demand for agriculture, industry, and electricity generation. Additionally, the habitat and water quality have been substantially degraded because of sand mining, unplanned development, and pollution. These factors are responsible for degrading riverine habitats and pose serious challenges for sustainability and environmental health in the region (Hussain et al. 2020; Dagar et al. 2021).

METHODS

Our study area was divided into 15 equal river segments of 50 km each (Sites S1–S15; Table 1). Each year two boat-based continuous river surveys were conducted: post-monsoon/winter (November–February), during 0800–1200 h and 1500–1700 h, and pre-monsoon/summer (April–June), during 0600–0900 h and 1600–1800 h. The surveys were conducted between April 2018 and December 2021 using an inflatable boat powered by a 25 hp outboard motor (OBM) at a constant speed of 6–8 km/h. All observations were made using Nikon Aculon 10×50 binoculars. Photographs and detailed notes were also taken when possible.

Standard field guides were used to confirm the identity of the species (Ali 2002; Kazmierczak and van Perlo 2003; Grimmett et al. 2019). The boat was stopped for species identifications and individual counts when large congregations were sighted. Opportunistic bird observations along the river were also included in the checklist. The common names and taxonomic positions of birds were adopted from the Handbook of the Birds of the World and the BirdLife International Digital Checklist of the Birds of the World (HBW and BirdLife International 2024). Species were categorised as resident, winter visitor, and summer visitor (Ali and Ripley 1995; Kumar et al. 2005). Only bird species that are ecologically dependent on the wetland for at least a part of their annual cycle (Ramsar Convention 1994) were considered in our study. The species were also categorised by the number of sites occupied following MacKinnon and Phillipps (1993). The species occupied >81% of the sites are categorized as common (C), 61–80% of the sites as fairly common (FC), 21–60% as uncommon (Uc), and ≤20% of the sites are considered rare. The conservation status of the species was adopted from the IUCN Red List of threatened species (IUCN 2024). The national protection status was taken from the *Indian Wild Life (Protection) Act, 1972* (WPA), as amended in 2022.

Table 1. Geographical locations of the surveyed sites in the middle stretch of the Ganga River.

Site	Start		End		Average elevation a.s.l. (m)	Species richness
	Latitude (°N)	Longitude (°E)	Latitude (°N)	Longitude (°E)		
S1	29.8127	078.1764	29.4344	078.0330	220	79
S2	29.4344	078.0330	29.0427	078.0931	200	79
S3	29.0427	078.0931	28.6648	078.1987	180	72
S4	28.6648	078.1987	28.2714	078.3268	170	76
S5	28.2714	078.3268	27.9924	078.6817	160	86
S6	27.9924	078.6817	27.7955	079.0871	140	79
S7	27.7955	079.0871	27.5675	079.4823	130	74
S8	27.5675	079.4823	27.2244	079.7126	120	72
S9	27.2244	079.7126	26.9419	080.0284	110	76
S10	26.9419	080.0284	26.6105	080.2791	100	75
S11	26.6105	080.2791	26.2722	080.5689	90	73
S12	26.2722	080.5689	26.0553	080.9028	90	77
S13	26.0553	080.9028	25.8474	081.2644	80	69
S14	25.8474	081.2644	25.5733	081.5651	70	64
S15	25.5733	081.5651	25.4302	081.8886	70	65

RESULTS

We recorded 107 species of waterbirds in the study area. These belong to 11 orders and 25 families (Table 2). The Anatidae family (20 species) was most abundant, followed by Scolopacidae (14 species), Ardeidae and Laridae (nine species each), Charadriidae (seven species), Ciconiidae and Rallidae (five species each), Motacillidae (four species), Accipitridae, Alcedinidae, Gruidae, Hirundinidae, Phalacrocoracidae,

Table 2. Annotated list of birds from the middle stretch of the Ganga River. IUCN: International Union for Conservation of Nature, LC: Least Concern, NT: Near Threatened, VU: Vulnerable, EN: Endangered, WPA: Wild Life (Protection) Act, 1972, II Part-B: Schedule II Part B, I Part-B: Schedule I Part-B, R/LM: Resident/Local Migrant, R/WM: Resident/Winter Migrant, WM: Winter Migrant, R: Resident, C: Common, FC: Fairly Common, UC: Uncommon, Ra: Rare.

Taxon	Common name	Site	IUCN	WPA	Status	Abundance
ANSERIFORMES						
Anatidae						
Dendrocygna javanica	Lesser Whistling-duck	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15	LC	II Part-B	R/LM	C
Anser indicus	Bar-headed Goose	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15	LC	II Part-B	R/WM	C
Anser anser	Greylag Goose	1, 2, 3, 4, 5, 7, 8, 10, 12	LC	II Part-B	WM	UC
Anser albifrons	Greater White-fronted Goose	2	LC	II Part-B	WM	Ra
Mergus merganser	Goosander	1, 2, 6, 7, 8	LC	II Part-B	R/WM	UC
Tadorna tadorna	Common Shelduck	1, 3, 5, 6, 8, 9, 10, 12, 13, 15	LC	II Part-B	WM	FC
Tadorna ferruginea	Ruddy Shelduck	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Sarkidiornis melanotos	Knob-billed Duck	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15	LC	II Part-B	R/LM	C
Netta rufina	Red-crested Pochard	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C
Aythya ferina	Common Pochard	3, 5, 7	VU	I Part-B	WM	Ra
Aythya nyroca	Ferruginous Duck	5, 9	NT	II Part-B	R/WM	Ra
Aythya fuligula	Tufted Duck	5, 11	LC	II Part-B	WM	Ra
Spatula querquedula	Garganey	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	LC	II Part-B	WM	FC
Spatula clypeata	Northern Shoveler	1, 2, 3, 4, 5, 6, 10, 12, 14, 15	LC	II Part-B	WM	FC
Mareca strepera	Gadwall	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C
Mareca penelope	Eurasian Wigeon	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13	LC	II Part-B	WM	FC
Anas poecilorhyncha	Indian Spot-billed Duck	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	LC	II Part-B	R/LM	FC
Anas platyrhynchos	Mallard	1, 2, 3, 4, 6, 7, 8, 9, 10, 12	LC	II Part-B	R/WM	FC
Anas acuta	Northern Pintail	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C
Anas crecca	Common Teal	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C
PODICIPEDIFORMES						
Podicipedidae						
Tachybaptus ruficollis	Little Grebe	1, 2, 5, 6, 7, 9, 10, 11, 13, 14, 15	LC	II Part-B	R/LM	FC
Podiceps cristatus	Great Crested Grebe	1, 5, 7, 10	LC	II Part-B	R/WM	UC
GRUIFORMES						
Rallidae						
Zapornia akool	Brown Crake	5	LC	II Part-B	R/LM	Ra
Amaurornis phoenicurus	White-breasted Waterhen	3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R	FC
Porphyrio porphyrio	Purple Swamphen	5	LC	II Part-B	R/LM	Ra
Gallinula chloropus	Common Moorhen	5	LC	II Part-B	R/WM	Ra
Fulica atra	Common Coot	2, 5, 10, 11, 12	LC	II Part-B	R/WM	UC
GRUIFORMES						
Gruidae						
Anthropoides virgo	Demoiselle Crane	4, 6	LC	I Part-B	WM	Ra
Grus antigone	Sarus Crane	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14	VU	I Part-B	R/LM	C
Grus grus	Common Crane	1, 2, 4, 5, 6, 9, 10, 12, 13, 15	LC	I Part-B	WM	FC
CICONIIFORMES						
Ciconiidae						
Mycteria leucocephala	Painted Stork	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Anastomus oscitans	Asian Openbill	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Ciconia nigra	Black Stork	1, 2, 3, 6, 7, 8, 11, 14	LC	II Part-B	WM	UC
Ciconia episcopus	Asian Woollyneck	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	NT	II Part-B	R	C
Ephippiorhynchus asiaticus	Black-necked Stork	1, 2, 3, 4, 5, 6, 7, 8, 9, 12	NT	II Part-B	R	FC

Taxon	Common name	Site	IUCN	WPA	Status	Abundance
PELECANIFORMES Threskiornithidae						
Platalea leucorodia	Eurasian Spoonbill	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15	LC	I Part-B	R	C
Threskiornis melanocephalus	Black-headed Ibis	1, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15	NT	II Part-B	R/LM	FC
Pseudibis papillosa	Red-naped Ibis	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R	C
PELECANIFORMES Ardeidae						
Nycticorax nycticorax	Black-crowned Night-heron	1, 2, 4, 6, 9, 10, 12, 13, 14, 15	LC	II Part-B	R/LM	FC
Butorides striata	Green-backed Heron	1, 4, 5, 6, 9, 10, 11, 12, 13, 14	LC	II Part-B	R	FC
Ardeola grayii	Indian Pond-heron	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Bubulcus ibis	Cattle Egret	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Ardea cinerea	Grey Heron	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Ardea purpurea	Purple Heron	1, 2, 4, 5, 7, 9, 10, 11, 12, 13, 14	LC	II Part-B	R/LM	FC
Ardea alba	Great White Egret	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Ardea intermedia	Intermediate Egret	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Egretta garzetta	Little Egret	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
PELECANIFORMES Pelecanidae						
Pelecanus crispus	Dalmatian Pelican	1, 11	NT	II Part-B	WM	Ra
Pelecanus onocrotalus	Great White Pelican	11, 12, 13, 14	LC	II Part-B	R/WM	UC
SULIFORMES *Phalacrocoracidae*						
Microcarbo niger	Little Cormorant	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Phalacrocorax carbo	Great Cormorant	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Phalacrocorax fuscicollis	Indian Cormorant	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
SULIFORMES Anhingidae						
Anhinga melanogaster	Oriental Darter	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	NT	II Part-B	R/LM	C
CHARADRIIFORMES Burhinidae						
Burhinus indicus	Indian Thick-knee	4, 5, 6, 7, 8, 9	LC	II Part-B	R	UC
Esacus recurvirostris	Great Thick-knee	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14	NT	II Part-B	R/LM	FC
CHARADRIIFORMES Recurvirostridae						
Recurvirostra avosetta	Pied Avocet	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Himantopus himantopus	Black-winged Stilt	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
CHARADRIIFORMES Charadriidae						
Charadrius dubius	Little Ringed Plover	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Charadrius alexandrinus	Kentish Plover	1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 13, 15	LC	II Part-B	R/WM	FC
Charadrius mongolus	Siberian Sandplover	3, 6, 7, 10, 11, 12, 13, 15	EN	II Part-B	R/WM	UC
Vanellus duvaucelii	River Lapwing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	NT	II Part-B	R/LM	C
Vanellus cinereus	Grey-headed Lapwing	11	LC	II Part-B	WM	Ra
Vanellus indicus	Red-wattled Lapwing	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
Vanellus leucurus	White-tailed Lapwing	5	LC	II Part-B	WM	Ra
CHARADRIIFORMES Rostratulidae						
Rostratula benghalensis	Greater Painted-snipe	13, 15	LC	II Part-B	R/LM	Ra
CHARADRIIFORMES Jacanidae						
Hydrophasianus chirurgus	Pheasant-tailed Jacana	1, 6, 11	LC	II Part-B	R/LM	Ra
Metopidius indicus	Bronze-winged Jacana	6, 9, 10, 11, 13	LC	II Part-B	R	UC
CHARADRIIFORMES Scolopacidae						
Numenius phaeopus	Whimbrel	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C

Taxon	Common name	Site	IUCN	WPA	Status	Abundance
Numenius arquata	Eurasian Curlew	1, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14	NT	II Part-B	WM	FC
Limosa limosa	Black-tailed Godwit	1, 2, 4, 5, 6, 7, 8, 9, 10, 11	NT	II Part-B	WM	FC
Calidris pugnax	Ruff	2, 6, 11, 12, 14, 15	LC	II Part-B	WM	UC
Calidris ferruginea	Curlew Sandpiper	9, 11, 12	NT	II Part-B	WM	Ra
Calidris temminckii	Temminck's Stint	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C
Calidris minuta	Little Stint	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C
Actitis hypoleucos	Common Sandpiper	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Tringa ochropus	Green Sandpiper	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Tringa erythropus	Spotted Redshank	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	WM	C
Tringa nebularia	Common Greenshank	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	I Part-B	WM	C
Tringa totanus	Common Redshank	2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Tringa glareola	Wood Sandpiper	1, 2, 4, 5, 6, 7, 8, 9, 11, 13	LC	II Part-B	WM	FC
Tringa stagnatilis	Marsh Sandpiper	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13	LC	II Part-B	WM	FC
CHARADRIIFORMES Glareolidae						
Glareola lactea	Little Pratincole	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
CHARADRIIFORMES Laridae						
Rynchops albicollis	Indian Skimmer	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, 14, 15	EN	I Part-B	R/LM	C
Larus brunnicephalus	Brown-headed Gull	2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	FC
Larus ridibundus	Black-headed Gull	1, 2, 3, 5, 6, 8, 10, 11, 12, 14, 15	LC	II Part-B	R/WM	FC
Larus ichthyaetus	Pallas's Gull	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R	C
Sternula albifrons	Little Tern	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C
Gelochelidon nilotica	Common Gull-billed Tern	4, 5, 8	LC	I Part-B	R	Ra
Chlidonias hybrida	Whiskered Tern	1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 14, 15	LC	II Part-B	R	FC
Sterna aurantia	River Tern	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15	VU	I Part-B	R	C
Sterna acuticauda	Black-bellied Tern	1, 2, 3, 4, 5, 6, 7, 8, 9	EN	I Part-B	R	UC
ACCIPITRIFORMES Pandionidae						
Pandion haliaetus	Osprey	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	I Part-B	R	C
ACCIPITRIFORMES Accipitridae						
Aquila nipalensis	Steppe Eagle	1, 3, 4, 6, 8, 9, 10, 12, 13, 14, 15	EN	I Part-B	WM	FC
Circus aeruginosus	Western Marsh-harrier	7, 12	LC	I Part-B	WM	Ra
Haliaeetus leucoryphus	Pallas's Fish-eagle	1, 12, 14	EN	I Part-B	R/WM	Ra
CORACIIFORMES Meropidae						
Merops philippinus	Blue-tailed Bee-eater	2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	FC
CORACIIFORMES Alcedinidae						
Alcedo atthis	Common Kingfisher	2, 4, 5	LC	II Part-B	R/WM	Ra
Ceryle rudis	Pied Kingfisher	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R	C
Halcyon smyrnensis	White-throated Kingfisher	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
FALCONIFORMES Falconidae						
Falco peregrinus	Peregrine Falcon	1, 3, 4, 5, 6, 8, 9, 11, 12, 13, 14, 15	LC	I Part-B	R/WM	FC
PASSERIFORMES Hirundinidae						
Hirundo smithii	Wire-tailed Swallow	2	LC	II Part-B	R	Ra
Hirundo rustica	Barn Swallow	1, 2, 3, 4, 11, 12, 13, 15	LC	II Part-B	R/WM	UC
Riparia chinensis	Asian Plain Martin	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/LM	C
PASSERIFORMES Motacillidae						
Motacilla flava	Western Yellow Wagtail	1, 2, 3, 5, 11, 12, 13, 14	LC	II Part-B	R/WM	UC

Taxon	Common name	Site	IUCN	WPA	Status	Abundance
Motacilla citreola	Citrine Wagtail	1, 2, 3, 4, 5, 6	LC	II Part-B	R/WM	UC
Motacilla maderaspatensis	White-browed Wagtail	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R	C
Motacilla alba	White Wagtail	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15	LC	II Part-B	R/WM	C

Threskiornithidae (three species each), and Burhinidae, Jacanidae, Pelecanidae, Podicipedidae, Recurvirostridae (two species each). Anhingidae, Falconidae, Glareolidae, Meropidae, Pandionidae, Rostratulidae were poorly represented by only a single species (Table 2). The area supports three Vulnerable species, 11 Near Threatened, and five Endangered species (IUCN 2024) (Table 2). Of all species observed, 15 are protected under Schedule I of the WPA (Table 2). Among the avian species observed in the study area, 47 species (43.9%) were resident, 31 species (28.9%) were winter migrants, and 29 species (27.1%) were resident with winter migration (Table 2). Thirty-four species were observed at all sites. In contrast, seven species—*Anser albifrons* (Scopoli, 1769), *Zapornia akool* (Sykes, 1832), *Porphyrio porphyrio* (Linnaeus, 1758), *Gallinula chloropus* (Linnaeus, 1758), *Vanellus cinereus* (Blyth, 1842), *Vanellus leucurus* (Lichtenstein, 1823), and *Hirundo smithii* (Leach, 1818)—were observed from a single site and presumably localised. The maximum species richness (86 species) was observed from Site 5, and the minimum (64 species) was observed from Site 14.

Observations of selected species recorded from the middle stretch of the Ganga River

Family Anatidae

***Dendrocygna javanica* (Horsfield, 1821)**
Lesser Whistling-duck
Figure 2A

Observations. INDIA – Uttar Pradesh • Amroha; Site 4; 28.5560°N, 078.2110°E; 180 m a.s.l.; 25.IV.2018, A.A. Usmani obs. • Budaun; Site 6; 27.9614°N, 078.8034°E; 150 m a.s.l.; 14.XII.2019, A.A. Usmani obs. • Raebareli; Site 12; 26.1020°N, 080.6797°E; 90 m a.s.l.; 6.V.2019, A.A. Usmani obs.

Identification. A small duck with brown and chestnut body; bill slaty-grey and legs plumbeous-blue. Forehead and crown brown, and rest of head and neck fulvous grey. A noisy bird, whistles repeatedly.

***Anser indicus* (Latham, 1790)**
Bar-headed Goose
Figure 2B

Observations. INDIA – Uttar Pradesh • Muzaffarnagar; Site 2; 29.2648°N, 078.0926°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Kasganj; Site 6; 27.8826°N, 078.8994°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Unnao; Site 10; 26.9262°N, 080.0469°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs.

Identification. An ashy-grey, white and brown goose, with two characteristic, black bars on the white head. Bill yellow with a black tip.

***Anser anser* (Linnaeus, 1758)**
Greylag Goose
Figure 2C

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.6431°N, 078.1195°E; 220 m a.s.l.; 7.II.2021, A.A. Usmani obs. • Sambhal; Site 4; 28.2918°N, 078.3149°E; 170 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Fatehpur; S12; 26.2116°N, 080.5978°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A large grey-brown goose with bill and legs pink. Base of bill with a very narrow white feather rim. Head and neck ashy-brown; back and rump pale.

***Mergus merganser* (Linnaeus, 1758)**
Goosander
Figure 2D

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7102°N, 078.1828°E; 220 m a.s.l.; 7.II.2021, A.A. Usmani obs. • Farrukhabad; Site 8; 27.4740°N, 079.6084°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs.

Identification. Neck, narrow, slender; bill pointed, red; legs red. Male with dark-green head and white breast. Female with white chin and throat and grey-brown upperparts.

Figure 2. Birds of the middle stretch of the Ganga River **A.** *Dendrocygna javanica*. **B.** *Anser indicus*. **C.** *Anser anser*. **D.** *Mergus merganser*. **E.** *Tadorna ferruginea*. **F.** *Sarkidiornis melanotos*. **G.** *Netta rufina*. **H.** *Aythya ferina*. **I.** *Aythya nyroca*. **J.** *Spatula clypeata*. **K.** *Anas poecilorhynchav* **L.** *Anas acuta*.

***Tadorna ferruginea* (Pallas, 1764)**
Ruddy Shelduck
Figure 2E

Observations. INDIA – UTTAR PRADESH • Amroha; Site 3; 28.9174°N, 078.1116°E; 180 m a.s.l.; 4.II.2019, A.A. Usmani obs. • Aligarh; Site 5; 28.0416°N, 078.5805°E; 150 m a.s.l.; 13.XII.2019, A.A. Usmani obs. • Pratapgarh; Site 14; 25.6857°N, 081.3971°E; 70 m a.s.l.; 17.II.2019, A.A. Usmani obs.

Identification. A large, orange-brown duck with a pale head and neck; beak black. Wing-coverts white, and speculum prominent and metallic green.

***Sarkidiornis melanotos* (Pennant, 1769)**
Knob-billed Duck
Figure 2F

Observations. INDIA – Uttar Pradesh • Meerut; Site 2; 29.0950, 078.0745°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Kannauj; Site 9; 27.0435°N, 079.9784°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Fatehpur; Site 12; 26.0813°N, 080.7241°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A large, glossy, blue-black and white duck. Males with a swollen, fleshy knob (comb) on bill. Females smaller, dull-coloured, and without a comb.

***Netta rufina* (Pallas, 1773)**
Red-crested Pochard
Figure 2G

Observations. INDIA – Uttar Pradesh • Sambhal; Site 5; 28.2259°N, 078.3791°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Hardoi; Site 9; 27.1460°N, 079.9101°E; 110 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Kanpur Nagar; Site 11; 26.5101°N, 080.3188°E; 90 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Pratapgarh; Site 14; 25.6857, 081.3971°E; 70 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. Males with golden-orange head, a silky chestnut crest, bright crimson bill, and fleshy, dull-red legs and feet. Females with pale, dull wings, dark crown, and dusky-black bill.

***Aythya ferina* (Linnaeus, 1758)**
Common Pochard
Figure 2H

Observations. INDIA – Uttar Pradesh • Bulandshahr; Site 5; 28.2641°N, 078.3500°E; 180 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.2259°N, 078.3791°E; 160 m a.s.l.; 12.XII.2019, A.A. Usmani obs.

Identification. Male with deep-chestnut head and neck; black bill with a pale-grey band near tip. Female with rufous-brown head, neck, upper back, and breast.

***Aythya nyroca* (Güldenstädt, 1770)**
Ferruginous Duck
Figure 2I

Observations. INDIA – Uttar Pradesh • Sambhal; Site 5; 28.1845°N, 078.4005°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Hardoi; Site 9; 27.1314°N, 079.9556°E; 110 m a.s.l.; 27.II.2021, A.A. Usmani obs.

Identification. Male with deep-chestnut head, neck, and breast; bill bluish black; iris white. Female with iris dark, brownish; legs dark, slaty. Female with duller colour a less contrasting off-white belly.

***Spatula clypeata* (Linnaeus, 1758)**
Northern Shoveler
Figure 2J

Observations. INDIA – Uttar Pradesh • Bulandshahr; Site 4; 28.3703°N, 078.2745°E; 170 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.0958°N, 078.5045°E; 150 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Kanpur Nagar; Site 10; 26.8261°N, 080.1200°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs.

Identification. Bill large, spatulate (shovel-shaped). Males with glossy, green head and neck; eyes yellow and breast white. Females with greyish-blue shoulder patch.

***Anas poecilorhyncha* (Forster, 1781)**
Indian Spot-billed Duck
Figure 2K

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3097°N, 078.0996°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Budaun; Site 6; 27.9528°N, 078.8442°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Farrukhabad; Site 8; 27.5290°N, 079.5406°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs.

Identification. Bill black, with yellow tip; eye-stripe yellow. Speculum white and green. Plumage brown, with scaly patterns.

***Anas acuta* (Linnaeus, 1758)**
Northern Pintail
Figure 2L

Observations. INDIA – Uttar Pradesh • Amroha; Site 3; 28.9174°N, 078.1116°E; 180 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Budaun; Site 6; 27.8537°N, 078.9337°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.4757°E, 081.7562°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. Males with chocolate-brown head, a white stripe down side of neck, and a long, pointed, pin-like tail. Females mottled brown and buff; tail pointed but pin-less.

Family Podicipedidae

***Tachybaptus ruficollis* (Pallas, 1764)**
Little Grebe
Figure 3A

Observations. INDIA – Uttar Pradesh • Muzaffarnagar; Site 2; 29.2648°N, 078.0926°E; 200 m a.s.l.; 1.II.2020, A.A. Usmani obs. • Bulandshahr; Site 5; 28.1845°N, 078.4005°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Unnao; Site 10; 26.8951°N, 080.0844°E; 100 m a.s.l.; 20.XII.2019, A.A. Usmani obs.

Identification. A small, tailless aquatic bird with short, pointed bill. Breeding individuals with blackish-brown nape, crown, and forehead.

***Podiceps cristatus* (Linnaeus, 1758)**
Great Crested Grebe
Figure 3B

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7498°N, 078.2027°E; 230 m a.s.l.; 7.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.2259°N, 078.3791°E; 160 m a.s.l.; 3.II.2020, A.A. Usmani obs. • Farrukhabad; Site 7; 27.6418°N, 079.3528°E; 130 m a.s.l.; 15.XII.2019, A.A. Usmani obs. • Kanpur Nagar; Site 10; 26.8951°N, 080.0844°E; 100 m a.s.l.; 8.II.2020, A.A. Usmani obs.

Identification. A tailless aquatic bird, with a slender, white neck; bill straight, pointed; body comparatively larger than the *Tachybaptus ruficollis*. Head with two backwardly directed ear tufts.

Family Rallidae

***Porphyrio porphyrio* (Linnaeus, 1758)**
Purple Swamphen
Figure 3C

Observations. INDIA – Uttar Pradesh • Bulandshahr; Site 5; 28.1845°N, 078.4005°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs.

Identification. Body purple-blue; Easily identified by its characteristic red forehead, bill, and legs.

***Gallinula chloropus* (Linnaeus, 1758)**
Common Moorhen
Figure 3D

Observations. INDIA – Uttar Pradesh • Sambhal; Site 5; 28.2259°N, 078.3791°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs.

Identification. Head and neck dark grey. Underparts brown. Iris, base of bill, and frontal shield red.

***Fulica atra* (Linnaeus, 1758)**
Common Coot
Figure 3E

Observations. INDIA – Uttar Pradesh • Sambhal; Site 5; 28.2259°N, 078.3791°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Unnao; Site 10; 26.8951°N, 080.0844°E; 100 m a.s.l.; 08.II.2020, A.A. Usmani obs. • Kanpur Nagar; Site 11; 26.5480°N, 080.3059°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs.

Identification. Body slaty-black, easily identified by its white, pointed bill and white frontal shield.

Family Gruidae

***Grus antigone* (Linnaeus, 1758)**
Sarus Crane
Figure 3F

Observations. INDIA – Uttar Pradesh • Amroha; Site 3; 28.7621°N, 078.1450°E; 180 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Farrukhabad; Site 8; 27.4740°N, 079.6084°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Unnao; Site 11; 26.3694°N, 080.5108°E; 90 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Raebareli; Site 13; 26.0675°N, 081.0215°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. The largest Indian crane; plumage grey; head and upper neck red.

Figure 3. Birds of the middle stretch of the Ganga River **A.** *Tachybaptus ruficollis*. **B.** *Podiceps cristatus*. **C.** *Porphyrio porphyrio*. **D.** *Gallinula chloropus*. **E.** *Fulica atra* **F.** *Grus antigone* **G.** *Mycteria leucocephala*. **H.** *Anastomus oscitans*. **I.** *Ciconia nigra*. **J.** *Ciconia episcopus*. **K.** *Ephippiorhynchus asiaticus*. **L.** *Platalea leucorodia*.

Family Ciconiidae

***Mycteria leucocephala* (Pennant, 1769)**
Painted Stork
Figure 3G

Observations. INDIA – Uttar Pradesh • Meerut; Site 2; 29.0950°N, 078.0745°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Hapur; Site 3; 28.8758°N, 078.1182°E; 180 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Farrukhabad; Site 7; 27.6118°N, 079.4444v; 130 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Kannauj; Site

9; 26.9633°N, 080.0203°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Fatehpur; Site 13; 26.0283°N, 081.0490°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A large black and white bird with long, pink legs and a yellowish bill and face. Wing coverts characteristically rosy-pink.

***Anastomus oscitans* (Boddaert, 1783)**
Asian Openbill
Figure 3H

Observations. INDIA – Uttar Pradesh • Amroha; Site 3; 28.9174°N, 078.1116°E; 180 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Budaun; Site 6; 27.9203°N, 078.8755°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Kaushambi; Site 14; 25.7792°N, 081.3572°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.4952°N, 081.8882°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. A comparatively small, white stork with a black tail. Bill peculiar, with arching mandibles leaving a narrow gap between.

***Ciconia nigra* (Linnaeus, 1758)**
Black Stork
Figure 3I

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.4134°N, 078.0411°E; 210 m a.s.l.; 8.II.2021, A.A. Usmani obs. • Kaushambi; Site 14; 25.7627°N, 081.4004°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A black stork with white underparts and a reddish bill and legs.

***Ciconia episcopus* (Boddaert, 1783)**
Asian Woollyneck
Figure 3J

Observations. INDIA – Uttar Pradesh • Meerut; Site 2; 29.0950°N, 078.0745°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Unnao; Site 10; 26.9262°N, 080.0469°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Raebareli; Site 12; 26.0234°N, 080.8423°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.4757°N, 081.7562°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. A large black and white stork, with a conspicuously white, woolly neck. Head with black cap; legs red.

***Ephippiorhynchus asiaticus* (Latham, 1790)**
Black-necked Stork
Figure 3K

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7498°N, 078.2027°E; 230 m a.s.l.; 7.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.0958°N, 078.5045°E; 150 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Farrukhabad; Site 8; 27.5536°N, 079.5026°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Hardoi; Site 9; 27.1649°N, 079.8673°E; 110 m a.s.l.; 26.II.2021, A.A. Usmani obs.

Identification. Black and white stork with black bill and large legs. Neck black, with varying sheen. Males characteristically brown; females with yellow iris.

Family Threskiornithidae

***Platalea leucorodia* (Linnaeus, 1758)**
Eurasian Spoonbill
Figure 3L

Observations. INDIA – Uttar Pradesh • Meerut; Site 2; 29.1761°N, 078.1033°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Kannauj; Site 9; 27.1460°N, 079.9101°E; 110 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Fatehpur; Site 12; 26.2116°N, 080.5978°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A white bird with a characteristic long, flat, spatula-shaped black bill with a yellowish tip. Sexes alike, but with females slightly smaller.

***Threskiornis melanocephalus* (Latham, 1790)**
Black-headed Ibis
Figure 4A

Observations. INDIA – Uttar Pradesh • Sambhal; Site 5; 28.1845°N, 078.4005°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Hardoi; Site 9; 27.1460°N, 079.9101°E; 110 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Fatehpur; Site 13; 25.9586°N, 081.1719°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. White bird with black neck, head, and downcurved bill.

Figure 4. Birds of the middle stretch of the Ganga River. **A.** *Threskiornis melanocephalus*. **B.** *Pseudibis papillosa*. **C.** *Nycticorax nycticorax*. **D.** *Ardeola grayii*. **E.** *Bubulcus ibis*. **F.** *Ardea cinerea*. **G.** *Ardea purpurea*. **H.** *Egretta garzetta*. **I.** *Anhinga melanogaster*. **J.** *Esacus recurvirostris*. **K.** *Recurvirostra avosetta*. **L.** *Himantopus himantopus*.

***Pseudibis papillosa* (Temminck, 1824)**
Red-naped Ibis
Figure 4B

Observations. INDIA – **Uttar Pradesh** • Amroha; Site 3; 29.0237°N, 078.0797°E; 190 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.1845°N, 078.4005°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Kasganj; Site 7; 27.7932°N, 079.1122°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Unnao; Site 12; 26.1443°N, 080.6600°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Fatehpur; Site 13; 25.9367°N, 081.2140°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Kaushambi; Site 15; 25.5893°N, 081.6341°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. A blackish-brown bird with a down-curved, curlew-like bill. Legs brick-red. Head with a triangular red cap.

Family Ardeidae

***Nycticorax nycticorax* (Linnaeus, 1758)**
Black-crowned Night-heron
Figure 4C

Observations. INDIA – Uttar Pradesh • Muzaffarnagar; Site 2; 29.3413°N, 078.0684°E; 200 m a.s.l.; 1.II.2020, A.A. Usmani obs. • Hapur; Site 4; 28.6432°N, 078.1924°E; 190 m a.s.l.; 3.II.2020, A.A. Usmani obs. • Pratapgarh; Site 14; 25.7224°N, 081.3827°E; 70 m a.s.l.; 7.V.2019, A.A. Usmani obs. • Kaushambi; Site 15; 25.5893°N, 081.6341°E; 70 m a.s.l.; 8.V.2019, A.A. Usmani obs.

Identification. Grey and black heron, with crest, crown, and nape black. Legs pale green in breeding season, pinkish in non-breeding season.

***Ardeola grayii* (Sykes, 1832)**
Indian Pond-heron
Figure 4D

Observations. INDIA – Uttar Pradesh • Farrukhabad; Site 8; 27.5290°N, 079.5406°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Kannauj; Site 9; 27.0019°N, 079.9964°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Raebareli; Site 13; 25.9979°N, 081.0843°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.5893°N, 081.6341°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. A earthy-brown heron at rest, but snow-white in flight. Bill yellow, with a black tip and bluish base. Chin, throat, and fore-neck white.

***Bubulcus ibis* (Linnaeus, 1758)**
Cattle Egret
Figure 4E

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.5841°N, 078.0561°E; 210 m a.s.l.; 8.II.2021, A.A. Usmani obs. • Fatehpur; Site 12; 26.2116°N, 080.5978°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs.• Pratapgarh; Site 15; 25.5829°N, 081.5876°E; 70 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. Bill short, yellow; legs dark. All white in non-breeding individuals, but head, neck and mantle orange in breeding birds.

***Ardea cinerea* (Linnaeus, 1758)**
Grey Heron
Figure 4F

Observations. INDIA – Uttar Pradesh • Meerut; Site 3; 28.9886°N, 078.0588°E; 190 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Amroha; Site 4; 28.5560°N, 078.2110°E; 180 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Aligarh; Site 5; 28.0416°N, 078.5805°E; 150 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Kasganj; Site 7; 27.7682°N, 079.1538°E; 130 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Hardoi; Site 9; 27.0891°N, 079.9725°E; 110 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Raebareli; Site 13; 25.9709°N, 081.1237°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.5477°N, 081.6500°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. A large, yellow-billed, ashy-grey heron, with a long neck and legs. Neck white and crown with a black crest.

***Ardea purpurea* (Linnaeus, 1766)**
Purple Heron
Figure 4G

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7102°N, 078.1828°E; 220 m a.s.l.; 12.VI.2018, A.A. Usmani obs. • Muzaffarnagar; Site 2; 29.3413°N, 078.0684°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs.

Identification. A purple heron with a slaty bill. Chin, cheeks, and throat white. Legs and feet dark slaty-black. Sexes alike.

***Egretta garzetta* (Linnaeus, 1766)**
Little Egret
Figure 4H

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3413°N, 078.0684°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Bulandshahr; Site 4; 28.4492°N, 078.2831°E; 170 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Aligarh; Site 5; 28.0416°N, 078.5805°E; 150 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Unnao; Site 10; 26.7430°N, 080.1551°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Kaushambi; Site 14; 25.6213°N, 081.5168°E; 70 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A small egret with black bill and legs; feet yellow. Lores yellowish.

Family Anhingidae

***Anhinga melanogaster* (Pennant, 1769)**
Oriental Darter
Figure 4I

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.4134°N, 078.0411°E; 210 m a.s.l.; 8.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.0605°N, 078.5348°E; 160 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Farrukhabad; Site 8; 27.5536°N, 079.5026°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Kaushambi; Site 14; 25.6213°N, 081.5168°E; 70 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. Neck long, slender, snake-like; head narrow. Bill dagger-shaped, and tail fan-like.

Family Burhinidae

***Esacus recurvirostris* (Cuvier, 1829)**
Great Thick-knee
Figure 4J

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3097°N, 078.0996°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Bulandshahr; Site 4; 28.5989°N, 078.1983°E; 180 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.0958°N, 078.5045°E; 150 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Farrukhabad; Site 7; 27.6118°N, 079.4444°E; 130 m a.s.l.; 26.II.2021, A.A. Usmani obs.

Identification. A brown plover with yellow legs. Bill massive and distinctly upturned, with a yellow base. Eyes large, yellow, with two blackish bands.

Family Recurvirostridae

***Recurvirostra avosetta* (Linnaeus, 1758)**
Pied Avocet
Figure 4K

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3413°N, 078.0684°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Kasganj; Site 7; 27.7682°N, 079.1538°E; 130 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Kanpur Nagar; Site 10; 26.8261°N, 080.1200°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.4952°N, 081.8882°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. An unmistakable bird with an upcurved, black bill. Body white, with a black head and hind neck.

***Himantopus himantopus* (Linnaeus, 1758)**
Black-winged Stilt
Figure 4L

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3097°N, 078.0996°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Amroha; Site 3; 28.7273°N, 078.1765°E; 190 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Fatehpur; Site 13; 25.9367°N, 081.2140°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.4996°N, 081.8450°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. A peculiar, long-legged wader with black and white wings. Bill black and legs crimson-red.

Family Charadriidae

***Charadrius dubius* (Scopoli, 1786)**
Little Ringed Plover
Figure 5A

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7102°N, 078.1828°E; 220 m a.s.l.; 4.XII.2019, A.A. Usmani obs. • Kasganj; Site 5; 28.0217°N, 078.6218°E; 150 m a.s.l.; 13.XII.2019, A.A. Usmani obs. • Fatehpur; Site 14; 25.8160°N, 081.3298°E; 80 m a.s.l.; 24.XII.2019, A.A. Usmani obs.

Identification. A ringed plover with a unique, nearly black frontal bar and a narrow, black breast band. Bill small, dark; legs yellowish or pinkish. Eye ring and legs yellow.

***Vanellus duvaucelii* (Lesson, 1826)**
River Lapwing
Figure 5B

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7102°N, 078.1828°E; 220 m a.s.l.; 7.II.2021,

Figure 5. Birds of the middle stretch of the Ganga River. **A.** *Charadrius dubius*. **B.** *Vanellus duvaucelii*. **C.** *Vanellus cinereus*. **D.** *Vanellus indicus*. **E.** *Rostratula benghalensis*. **F.** *Hydrophasianus chirurgus*. **G.** *Numenius arquata*. **H.** *Tringa erythropus*. **I.** *Glareola lactea*. **J.** *Rynchops albicollis*. **K.** *Larus ichthyaetus*. **L.** *Sternula albifrons*.

A.A. Usmani obs. • Bulandshahr; Site 4; 28.4834°N, 078.2501°E; 170 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Kasganj; Site 6; 27.8826°N, 078.8994°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Hardoi; Site 9; 27.0891°N, 079.9725°E; 110 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Fatehpur; Site 12; 26.0739°N, 080.7723°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Kaushambi; Site 15; 25.5206°N, 081.6753°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. Head, bill, and occipital crest black. Upper tail coverts and tail white. Legs and feet black.

***Vanellus cinereus* (Blyth, 1842)**
Grey-headed Lapwing
Figure 5C

Observations. INDIA – Uttar Pradesh • Kanpur Nagar; Site 11; 26.2900°N, 080.5538°E; 90 m a.s.l.; 22.XII.2019, A.A. Usmani obs. • Unnao; Site 11; 26.2900°N, 080.5538°E; 90 m a.s.l.; 22.XII.2019, A.A. Usmani obs.

Identification. A comparatively large lapwing, with red iris and yellow eyelids. Bill yellow; head and neck grey, with a black subterminal band.

***Vanellus indicus* (Boddaert, 1783)**
Red-wattled lapwing
Figure 5D

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3701°N, 078.0385°E; 210 m a.s.l.; 8.II.2021, A.A. Usmani obs. • Sambhal; Site 5; 28.1845°N, 078.4005°E; 160 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Farrukhabad; Site 8; 27.3083°N, 079.6466°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Unnao; Site 12; 26.1772°N, 080.6291°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Pratapgarh; Site 14; 25.6257°N, 081.4681°E; 70 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A plover with a unique red wattle, bill, and eyelids. Head, neck, and breast black. Legs yellow.

Family Rostratulidae

***Rostratula benghalensis* (Linnaeus, 1758)**
Greater Painted-snipe
Figure 5E

Observations. INDIA – Uttar Pradesh • Fatehpur; Site 13; 26.0675°N, 081.0215°E; 80 m a.s.l.; 14.V.2018, A.A. Usmani obs. • Prayagraj; Site 15; 25.4979°N, 081.7971°E; 70 m a.s.l.; 16.V.2018, A.A. Usmani obs.

Identification. Bill downcurved, pinkish. Females have head chestnut-brown with comma-like, white mark around eye. Males dull-coloured and smaller.

Family Jacanidae
***Hydrophasianus chirurgus* (Scopoli, 1786)**
Pheasant-tailed Jacana
Figure 5F

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7102°N, 078.1828°E; 220 m a.s.l.; 12.VI.2018, A.A. Usmani obs. • Budaun; Site 6; 27.8537°N, 078.9337°E; 140 m a.s.l.; 1.V.2018, A.A. Usmani obs. • Unnao; Site 11; 26.3694°N, 080.5108°E; 90 m a.s.l.; 12.V.2018, A.A. Usmani obs.

Identification. Face and large fore-neck white. Side of neck with a yellowish patch. Tail sickle-shaped.

Family Scolopacidae

***Numenius arquata* (Linnaeus, 1758)**
Eurasian Curlew
Figure 5G

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.6218°N, 078.0825°E; 210 m a.s.l.; 4.XII.2019, A.A. Usmani obs. • Amroha; Site 3; 28.6874°N, 078.2005°E; 180 m a.s.l.; 7.XII.2019, A.A. Usmani obs. • Farrukhabad; Site 8; 27.5536°N, 079.5026°E; 120 m a.s.l.; 16.XII.2019, A.A. Usmani obs. • Fatehpur; Site 12; 26.0739°N, 080.7723°E; 90 m a.s.l.; 23.XII.2019, A.A. Usmani obs.

Identification. A wader with a unique, long, downward-curved, brown bill. Legs and feet bluish. Bill longer and head pattern more uniform than in *Numenius phaeopus*.

***Tringa erythropus* (Pallas, 1764)**
Spotted Redshank
Figure 5H

Observations. INDIA – Uttar Pradesh • Budaun; Site 7; 27.7401°N, 079.1944°E; 130 m a.s.l.; 5.II.2020, A.A. Usmani obs. • Unnao; Site 12; 26.2538°N, 080.5823°E; 90 m a.s.l.; 10.II.2020, A.A. Usmani obs. • Pratapgarh; Site 14; 25.6590°N, 081.4366°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. Bill red and black. Legs red; head, hind neck, and back ashy brown. Breeding adults with black spots and a sooty appearance. Legs and bill longer than in *Tringa tetanus*.

Family Glareolidae

***Glareola lactea* (Temminck, 1820)**
Little Pratincole
Figure 5I

Observations. INDIA – Uttar Pradesh • Bijnor; Site 1; 29.7921°N, 078.1844°E; 230 m a.s.l.; 7.II.2021, A.A. Usmani obs. • Kasganj; Site 7; 27.7932°N, 079.1122°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Unnao; Site 11; 26.3694°N, 080.5108°E; 90 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Pratapgarh; Site 15; 25.5829°N, 081.5876°E; 70 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A sandy-grey small bird with a brown forehead. Wings long and pointed. Legs short and dark brown.

Family Laridae

***Rynchops albicollis* (Swainson, 1838)**
Indian Skimmer
Figure 5J

Observations. INDIA – Uttar Pradesh • Budaun; Site 6; 27.9855°N, 078.7063°E; 150 m a.s.l.; 14.XII.2019, A.A. Usmani obs. • Farrukhabad; Site 8; 27.5290°N, 079.5406°E; 120 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.4952°N, 081.8882°E; 70 m a.s.l.; 8.V.2019, A.A. Usmani obs.

Identification. Bill orange-red with lower mandible longer. Contrasting pied plumage, with cap black, legs and feet red. Sexes alike, but with female slightly smaller.

***Larus ichthyaetus* (Pallas, 1773)**
Pallas's Gull
Figure 5K

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3413°N, 078.0684°E; 200 m a.s.l.; 22.IV.2018, A.A. Usmani obs. • Hardoi; Site 9; 27.0891°N, 079.9725°E; 110 m a.s.l.; 7.V.2018, A.A. Usmani obs. • Kanpur Nagar; Site 11; 26.3965°N, 080.4711°E; 90 m a.s.l.; 12.V.2018, A.A. Usmani obs.

Identification. The largest gull in India. Bill yellow with an orange and black tip. Eyes dark, with two crescent-shaped white patches in adults.

***Sternula albifrons* (Pallas, 1764)**
Little Tern
Figure 5L

Observations. INDIA – Uttar Pradesh • Meerut; Site 2; 29.1761°N, 078.1033°E; 200 m a.s.l.; 21.IV.2019, A.A. Usmani obs. • Amroha; Site 3; 28.7273°N, 078.1765°E; 190 m a.s.l.; 23.IV.2019, A.A. Usmani obs. • Kasganj; Site 7; 27.7682°N, 079.1538°E; 130 m a.s.l.; 1.V.2019, A.A. Usmani obs. • Kannauj; Site 9; 27.0435°N, 079.9784°E; 100 m a.s.l.; 4.V.2019, A.A. Usmani obs. • Kaushambi; Site 15; 25.5206°N, 081.6753°E; 70 m a.s.l.; 8.V.2019, A.A. Usmani obs.

Identification. A small tern with a white forehead, black lores, a black-tipped, yellow bill, and orange legs in breeding adults. Bill blackish, legs dark, and with nape band in non-breeding individuals.

***Sterna aurantia* (J.E. Gray, 1831)**
River Tern
Figure 6A

Observations. INDIA – Uttar Pradesh • Meerut; Site 2; 29.1389°N, 078.0769°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Bulandshahr; Site 5; 28.2641°N, 078.3500°E; 180 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Kasganj; Site 6; 27.8195°N, 079.0202°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Farrukhabad; Site 8; 27.3514°N, 079.6572°E; 110 m a.s.l.; 26.II.2021, A.A. Usmani obs.

Identification. A pale-grey and white bird with a deeply forked tail, bright-yellow bill, and short red legs. Bill orange-yellow; cap black; underparts greyish-white in breeding adults.

***Sterna acuticauda* (J.E. Gray, 1832)**
Black-bellied Tern
Figure 6B

Observations. INDIA – Uttar Pradesh • Amroha; Site 3; 29.0237°N, 078.0797°E; 190 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Sambhal; Site 4; 28.3703°N, 078.2745°E; 170 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Budaun; Site 7; 27.7151°N, 079.2367°E; 130 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Hardoi; Site 9; 27.0891°N, 079.9725°E; 110 m a.s.l.; 27.II.2021, A.A. Usmani obs.

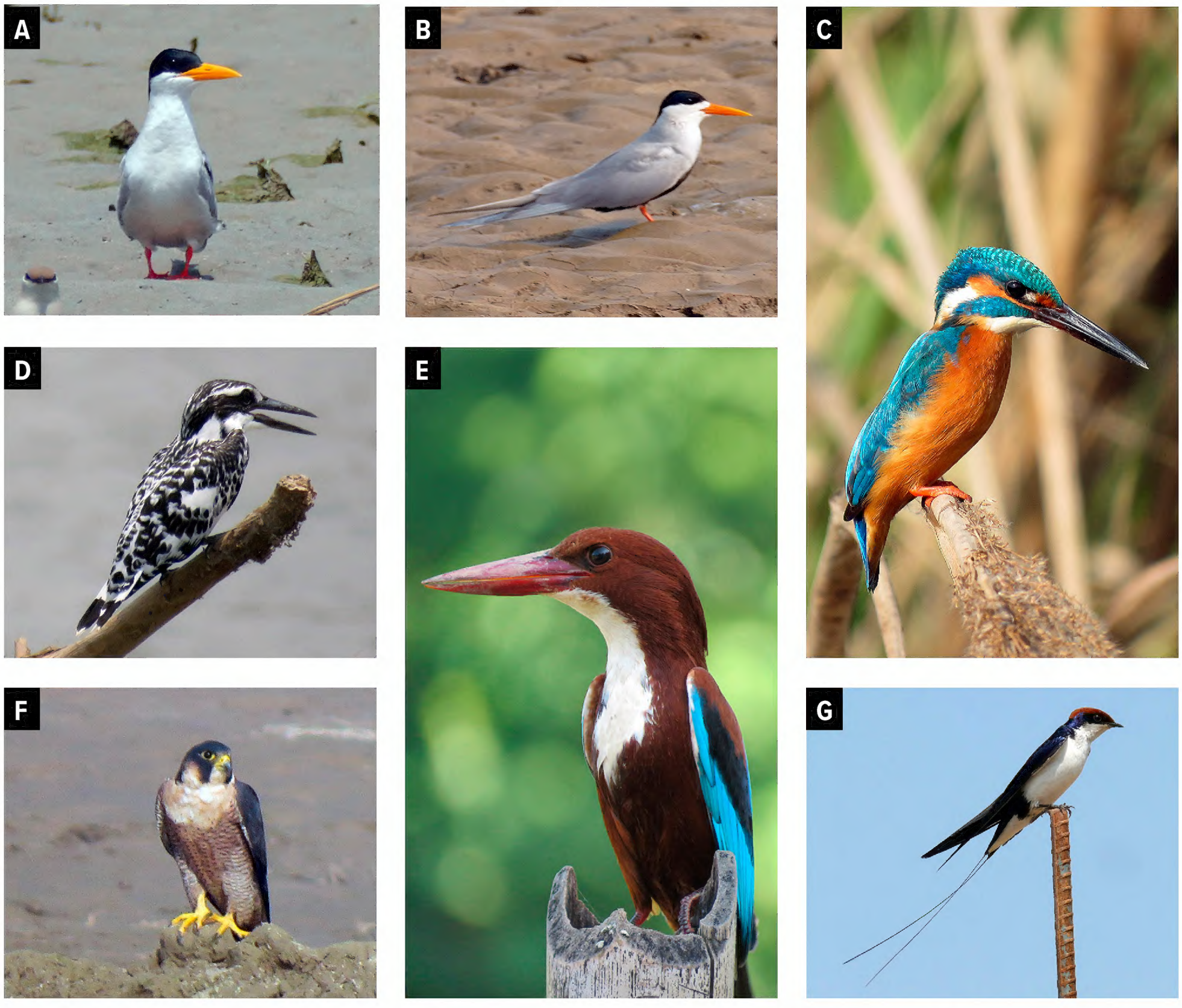

Figure 6. Birds of the middle stretch of the Ganga River **A.** *Sterna aurantia*. **B.** *Sterna acuticauda*. **C.** *Alcedo atthis*. **D.** *Ceryle rudis*. **E.** *Halcyon smyrnensis*. **F.** *Falco peregrinus* **G.** *Hirundo smithii*.

Identification. Bill orange, with a dusky tip. Tail deeply forked; legs orange. Sexes alike.

Family Alcedinidae

***Alcedo atthis* (Linnaeus, 1758)**
Common Kingfisher
Figure 6C

Observations. INDIA – Uttar Pradesh • Sambhal; Site 4; 28.2918°N, 078.3149°E; 170 m a.s.l.; 11.XII.2019, A.A. Usmani obs. • Aligarh; Site 5; 28.0416°N, 078.5805°E; 150 m a.s.l.; 4.II.2020, A.A. Usmani obs.

Identification. A small, blue-green kingfisher (from above), with a long, pointed, black bill and deep-rust-coloured underparts. Chin and throat white.

***Ceryle rudis* (Linnaeus, 1758)**
Pied Kingfisher
Figure 6D

Observations. INDIA – Uttar Pradesh • Meerut; Site 2; 29.1761°N, 078.1033°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Bulandshahr; Site 4; 28.4063°N, 078.2912°E; 170 m a.s.l.; 12.II.2021, A.A. Usmani obs. • Budaun; Site 6; 27.9528°N, 078.8442°E; 140 m a.s.l.; 25.II.2021, A.A. Usmani obs. • Unnao; Site 10; 26.9262°N, 080.0469°E; 100 m a.s.l.; 27.II.2021, A.A. Usmani obs. • Fatehpur; Site 13; 25.9367°N, 081.2140°E; 80 m a.s.l.; 28.II.2021, A.A. Usmani obs.

Identification. A black and white kingfisher with a small crest. A black band extends over the eyes; supercilium white.

***Halcyon gularis* (Kuhl, 1820)**
White-throated Kingfisher
Figure 6E

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3097°N, 078.0996°E; 200 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Hapur; Site 3; 28.8758°N, 078.1182°E; 180 m a.s.l.; 11.II.2021, A.A. Usmani obs. • Fatehpur; Site 12; 26.0813°N, 080.7241°E; 90 m a.s.l.; 28.II.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.5075°N, 081.7219°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. A large kingfisher with a long, thick, red bill. Head and underparts chocolate-brown. Breast and throat white.

Family Falconidae

***Falco peregrinus* (Tunstall, 1771)**
Peregrine Falcon
Figure 6F

Observations. INDIA – Uttar Pradesh • Bulandshahr; Site 4; 28.4834°N, 078.2501°E; 170 m a.s.l.; 3.II.2020, A.A. Usmani obs. • Hardoi; Site 9; 27.2181°N, 079.7369°E; 110 m a.s.l.; 26.II.2021, A.A. Usmani obs. • Kaushambi; Site 15; 25.5206°N, 081.6753°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs. • Prayagraj; Site 15; 25.4979°N, 081.7971°E; 70 m a.s.l.; 13.I.2021, A.A. Usmani obs.

Identification. Head prominently slaty-black, and upperparts grey, with narrow blackish barring. Chin and throat white.

Family Hirundinidae

***Hirundo smithii* (Leach, 1818)**
Wire-tailed Swallow
Figure 6G

Observations. INDIA – Uttar Pradesh • Bijnor; Site 2; 29.3701°N, 078.0385°E; 210 m a.s.l.; 4.XII.2019, A.A. Usmani obs.

Identification. Body glossy, steel-blue above; cap chestnut-brown. Easily recognised by the white underparts and two long tail wires.

DISCUSSION

Our study covers areas of the Ganga River that were not fully explored in earlier avifaunal studies. We observed 107 species, which is near the estimated species richness (Chao-1), indicating that the survey captured >98% of the species present. In the 80 km stretch within the State Wildlife Barasingha Sanctuary, Khan et al. (2013) reported 53 species of waterbirds, while we recorded 87 species. Joshi et al. (2021) and Arya et al. (2020) documented 66 and 92 aquatics species, respectively, from the Haiderpur Wetland, a backwater area of the Middle Ganga Barrage on the Ganga River. Rahmani (1981) reported 30 important waterbirds from a small stretch of the river near Narora Barrage, and Bashir et al. (2012) recorded 50 waterbirds from the same area. Rao (2001) documented 48 species from the stretch between Rishikesh and Kanpur. In comparison, we recorded 62 waterbirds from this stretch. While most previous studies focused on specific areas of the middle stretch, we covered the entire 750 km stretch from Balawali in District Bijnor to Sangam in District Prayagraj, Uttar Pradesh. That resulted in 102 aquatic species from the non-protected stretch.

Our study documented 33.5% of all waterbird species and 8% of the total avifauna reported from India (Kumar et al. 2005; BirdLife International 2024). The presence of eight globally threatened species (IUCN 2024), 15 species listed under schedule I of the *Indian Wild Life Protection Act*, and a significant proportion (30%) of migratory species indicate the rich avifaunal diversity of this stretch of the Ganga River. Our data highlight the importance of this riverine ecosystem as waterbird habitat, and this good avifaunal diversity, in addition to the presence of other remarkable fauna, underscores the ecological health and integrity of the riverine habitat. A part of middle stretch of the river is protected within the large terrestrial protected area encompassed by the State Wildlife Barasingha Sanctuary. However, anthropogenic activities such as habitat degradation, flow alteration of the river caused by dams and barrages, and overexploitation of resources are destroying riverine ecosystems and biodiversity (Dudgeon 2000; Collen et al. 2010). Therefore, it is imperative to prioritize conservation efforts to protect and manage these riverine habitats.

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ADDITIONAL INFORMATION

Conflict of interest

The authors declare that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Author contributions

Conceptualization: SAH, RB. Data curation: AAU, PG. Formal analysis: AAU. Funding acquisition: RB, SAH. Investigation: RB, SAH. Methodology: AAU, SAH. Supervision: RB, SAH, VBM. Project administration: RB, SAH. Validation: AAU, PG, SAH. Visualization: AAU. Writing – original draft: AAU. Writing – review and editing: AAU, PG, VBM, SAH.

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Data availability

All data that support the findings of this study are available in the main text.

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